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(54) Optical flowmeter

(57) The optical flow-meter device (10) comprises an outer tubular body (11) provided with an inlet pipe fitting (12) and an outlet pipe fitting (13) for a fluid, and a tubular element (15) made of transparent plastic material, which sealingly extends inside the body (11) between the inlet and the outlet pipe fittings (12,13) of the flow-meter device (10). The outer tubular body (11) is provided with two facingly arranged side openings (18', 19') for the insertion of a light emitting element (18), respectively, a light receiving element (19) connected to an electronic flow control and digital reading unit (20). A light shuttering member (21) is axially slidable within the inner tubular element (15) and is shaped to allow the fluid to flow and at the same time to partialize or gradually shuttering the light beam between the emitter (18) and the receiver (19), providing an electronic signal proportional to the fluid flow running along the inner tubular element (15). A biasing spring member (26) acts on the light shuttering member (21) to balance the fluid thrust.

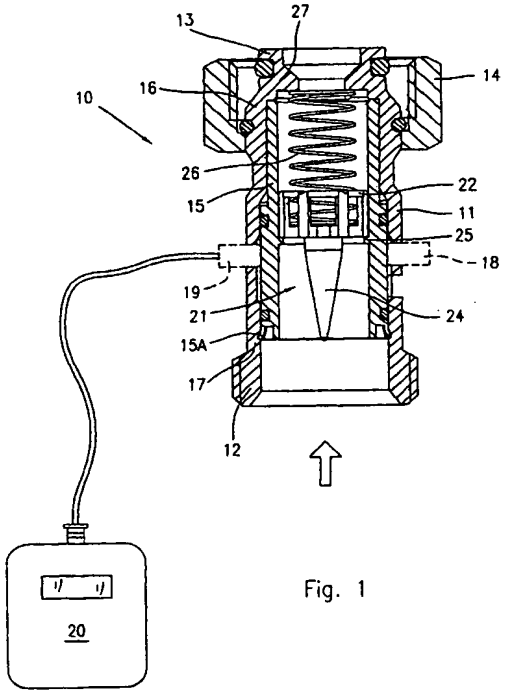

Fig. 1

EP 1 243 900 A2

Description

BACKGROUND OF THE INVENTION

[0001] This invention refers to a device for measuring the flow-rate of a fluid along a conduit, as well as regards a digital flow-meter comprising the aforementioned measuring device combined with an optical flow-rate detecting and reading system.

[0002] Several measuring devices are currently known by which it is possible to provide a visual indication of the flow-rate of a fluid flowing along a measuring tubular element, in which the flow-rate value is directly read on a flow-meter in respect to the position of a float visible through a suitable window, or by mechanical, magnetic or electrical detection to be read on a proper dial of an electronic reading instrument.

[0003] Float-type systems are widely diffused, in that they are easily installable and are of relatively low cost; nevertheless, they present the serious drawback of providing a somewhat imprecise measurement of the flow-rate, as well as being difficult to read in presence of a turbid fluid or due to a possible deposition of lime on the window for displaying the float.

[0004] While on one hand mechanical-type flow-meters provide a sufficiently precise measurement of the flow rate, nevertheless they are extremely complex in structure, and subject to wear problems, as well as allow only an in situ reading of the flow-rate without any possibility of transferring the detected data to remote positions or of managing the information.

[0005] There are also electric, magnetic or ultrasound-type of flow-rate measuring devices which require sophisticated technologies and the use of probes or electrical and/or magnetic components designed to come into contract with metal parts, while a fluid or a gas is flowing along a measuring pipe. Flow-meters of this kind are known for example by US -A- 6,189,389, US -A- 6,170,338 and US -A- 4,611,105.

[0006] Besides being structurally complex and relatively expensive, in that the various electric and/or magnetic members for measuring the flow-rate constitute an integral part of the same flow-meter, these types of flow-meters also involve some drawbacks, due to induced currents, eddy currents, or external magnetic fields which tend to negatively influence the measurement of the flow-rate.

OBJECT OF THE INVENTION

[0007] A first object of this invention is to provide a tubular flow-meter device for measuring the flow-rate of a fluid, liquid or gas, which can be permanently associated with a duct or circulation system for the fluid, and which can be used in combination with an electronic apparatus, made as a separate part, for detecting and measuring the flow-rate.

[0008] A second object of this invention is to provide a digital flow-meter capable of obviating the drawbacks of the previously known flow-meters, comprising the aforementioned tubular measuring device, combined with an electronic flow detecting apparatus provided with an optical flow sensing system which is wholly devoid of negative external influences, extremely economical and easily installable.

[0009] In this way, an operator, having a single reading instrument, can measure the flow in different points of a same circulation system for the fluid or in different systems, in which a tubular measuring device according to the invention has been installed.

BRIEF DESCRIPTION OF THE INVENTION

[0010] In general, according to a first aspect of the invention, a tubular device for measuring the flow-rate of a fluid along a duct, has been provided, the device comprising:

- an outer tubular body provided with an inlet pipe fitting and an outlet pipe fitting for the fluid;
- a tubular element, made of transparent plastic material, which sealing extends inside the outer tubular body, between the aforesaid inlet and outlet pipe fittings;
- said outer tubular body being provided on opposite sides with openings for seating, respectively, a light emitting element and a light receiving element facing with each other;
- an axially slidable light shuttering member entrained by the flow within the inner tubular element, said light shuttering member being shaped to partialize the light beam between the light emitting element and the light receiving element to provide an electric signal proportional to the flow-rate; and
- a biasing spring member acting on the light shuttering member to balance the thrust exerted by the fluid flowing along said inner tubular element of the device.

[0011] According to another aspect of the invention, an electronic flow-meter device has been provided, comprising a apparatus for sensing and measuring the flow-rate, in combination with the aforementioned tubular measuring device, in which the light emitter and light receiver are removably disposable into facingly arranged side openings in the outer tubular body of the measuring device, and in which the light emitter and light receiver are connected to an electronic control unit designed to provide a digital indication of the flow-rate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] These and further features of the invention, will be more clearly evident from the following description with reference to the accompanying drawings, in which:

- Fig. 1 shows an overall view of the whole flow-meter illustrating a first preferred embodiment of the tubular measuring device according to the invention;
- Fig. 2 shows a block diagram of the electronic flow-rate measuring and reading apparatus;
- Fig. 3 shows a longitudinal cross-sectional view of a possible variation of the tubular measuring device for a flow-meter according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0013] With reference to Figs. 1 and 2, a description is given of a first embodiment of a measuring device and an optical flow-meter according to this invention.

[0014] Reference number 10 in Fig. 1 indicates the tubular measuring device designed to be connected to a duct or a system through which a fluid circulates whose flow-rate is to be measured.

[0015] The device 10 comprises an outer tubular body 11 having an inlet pipe fitting 12 and an outlet pipe fitting 13 provided with a screw-on cap 14.

[0016] The device 10 also comprises an inner tubular element 15, also referred to as measuring tube, which sealingly extends in a coaxial direction in the tubular body 11, between the inlet pipe fitting 12 and the outlet pipe fitting 13, as shown.

[0017] The inner tubular element 15 is axially secured against an annular shoulder 16 in correspondence with the outlet pipe fitting 13, and against an annular shoulder 17 in correspondence with the inlet pipe fitting 12, by the re-flanging of its end 15A.

[0018] The outer tubular body 11 can be made of any suitable material, for example, of brass or of plastic material, while the inner tubular element 15 is made of transparent plastic material to allow the passage of a light beam, for example an infrared rays beam emitted by a light emitting diode 18, disposed on one side of the tubular body 11, received by an infrared receiving diode 19 on the side opposite the previous one, which are facingly arranged with each other and are connected to a computerised flow sensing and flow-rate reading unit, indicated as a whole by reference 20.

[0019] For this purpose, the outer tubular body 11, is provided with side openings 18' and 19' facing to each other to allow the insertion of a light emitting diode 18 and a light receiving diode 19 supported by suitable pliers, not shown, whereby it is possible at any time to freely introduce the two diodes 18 and 19 into their respective openings 18',19' to carry out a flow measuring operation, to be then again removed once the reading has been made.

[0020] In this way, the operator may use of a single instrument 20 to carry out the reading operations of the flow-rate in correspondence with the various points of a same system, or of different systems, where the respective measuring devices 10 according to the invention have been appropriately installed.

[0021] Referring again to Fig. 1, a light shuttering member, in particular a light shutter entrained by the flow, slides within the measuring tube 15, indicated as a whole by reference 21, comprising a guide cage 22 having peripheral passages for the fluid, from the bottom of which extends a conical casing 24 design to partially or totally intercept or shuttering the light beam emitted by the photodiode 18 and received by the photodiode 19, in relation to the position assumed.

Due to the particular conical profile of the casing 24, which converges towards the inlet pipe fitting 12, during the axial sliding of the shutter 21, under the thrust exerted by the fluid, balanced by a spring 26, the conical casing 24 gradually intercepts the light beam in the section between the two photodiodes 18 and 19, providing the instrument 20 with a corresponding electric signal indicating the value of the flow-rate of the fluid running through the inner tubular element 15.

[0022] For this purpose, the shutter 21 is forward pushed against a stop shoulder 25 inside the tubular element 15, by a calibrated biasing spring member 26 interposed between the bottom of the cage 22 and an annular shoulder 27 in correspondence with the outlet pipe fitting 13.

[0023] The biasing spring 26 axially acts on the light shutter 21 to balance the thrust exerted by the fluid which tends to drag the shutter 21 in its direction of flow.

[0024] It is therefore evident that the balanced position assumed by the shutter 21 under the opposing thrusts of the fluid flowing through the tubular element 15 and of the biasing spring 26, depends upon the value of the flow-rate of the fluid which at a given instant flows along the tubular element 15; consequently, the light beam received by the photodiode 19 is partially intercepted and the photodiode 19 in turn sends the instrument 20 a signal indicating the value of the measured flow-rate, expressed in litres per minute or in another measure unit, which appears on the display of the instrument 20.

[0025] Fig. 2 of the accompanying drawings shows, by way of example, a block diagram of the measuring instrument 20.

[0026] As shown, the measuring instrument 20 comprises a suitably programmed microprocessor 28 to control the various functions of the whole apparatus.

[0027] More precisely, the microprocessor 28 is connected, by means of a power adjusting interface 29, to the light emitting diode 18; likewise, the microprocessor 28 is connected, by means of a digital amplifier converter 30, or AD converter, to the light receiving diode 19.

[0028] The microprocessor 28 is also connected to the liquid crystal display 31, for viewing the reading, as well as to a serial interface 32 for a connection to a personal computer or other remote reading device.

[0029] The methods of use and operation of the flow-meter are as follows.

[0030] Whenever a measurement is to be made, an

operator equipped with the instrument 20, inserts the two photodiodes 18 and 19 into the corresponding seatings consisting of the side openings 18',19' in the outer tubular body 11.

[0031] After the instrument has been switched on by pressing an appropriate "ON" button, the microprocessor 28, through the interface 29, controls the transmission of a current value to the transmitting diode 18, equal to half the maximum permitted value; consequently, the receiving diode 19 transmits a signal to the microprocessor 28, through the amplifier 30, which should be equal to the signal generated by the light transmitter 18, in the absence of flow in the measuring duct 15. If the measured value is different, the microprocessor 28 suitably compensates the latter by means of a proper digital potentiometer inside the interface 29, controlled by the same microprocessor.

[0032] When the value measured by the receiving photodiode 19 is identical to that emitted by the emitter 18, or has been compensated as a result of the change due to the transparency variation of the fluid caused, for example, by impurities in the latter, or for other causes, the measurement of the flow-rate can be carried out by allowing the fluid to flow through the tubular measuring element 11. For this purpose, it is sufficient to press the start button on the instrument which, in addition to monitoring the flow values, saves them as data in a memory of the microprocessor, which can be subsequently read directly by means of the instrument 20, or by means of a remote reading instrument to which the microprocessor 28 is connected by means of the serial interface 32.

[0033] By suitable programming of the instrument 20, it is possible to carry out the flow-rate readings in different measure units, for example in litres or gallons per second, by selecting the required measure unit by means of a suitable button.

[0034] The flow-rate values read may be stored on the proper EEPROM memory and later displayed by pressing the appropriate button to retrieve them from the memory.

[0035] Whenever it is required to measure another dimension, for example the fluid temperature, in addition to the photodiodes 18 and 19, it is possible to make use of a temperature sensor having a probe, not shown, which can be introduced into a suitable opening 36 in the outer tubular body 11, by means of the same pincers for supporting the photodiodes 18 and 19. The instrument 20 should therefore be suitably preset, by means of the microprocessor 28, to control the various sensors and to selectively provide a temperature detection of the fluid, or a flow-rate measurement of the fluid, as described previously.

[0036] The light shutter 21 in Fig. 1 presents a body 24 having a conical shape which by moving forward or backward creates a continuous variation in the light beam which is emitted by the photodiode 18 and which passes through the transparent tubular element 15 and the fluid inside the latter and is received by the photodiode 19.

[0037] The geometry of the light shutter 21 need not necessarily to be the one shown in Fig. 1; it can be of any shape designed to obscure and so to gradually vary the quantity of light transmitted by the photodiode 18 and received by the photodiode 19.

[0038] A further possible embodiment of the shutter 21 is shown by way of example in Fig. 3, where the same numerical references of Fig. 1 have been used to indicate similar or equivalent parts.

[0039] The device of Fig. 3 differs from the device of Fig. 1 in that the light shutter 21 in this second case consists of a substantially cylindrical body 33 having an axial passage 34 for the fluid, which opens out at both ends towards the inlet pipe fitting 12 and respectively towards the outlet pipe fitting 13 of the measuring device.

[0040] Unlike the previous case, the light beam generated by the photodiode 18 passes through a pair of opposing slits 35, only one of which is shown in the cross-sectional view of Fig. 3, which are constantly maintained oriented in respect to the two photodiodes 18 and 19, by means of a longitudinal guide which prevents the shutter 21 from rotating.

[0041] The two openings 35 are substantially shaped in the form of an upturned V which opens out towards the lower edge of the shutter.

[0042] Other geometrical shapes of the shutter 21 are obviously possible, provided they are suitable for the desired purpose.

[0043] From what has been described and shown, it will be clear that what is provided is a tubular device for measuring flow-rates, capable of being used with an electronic reading apparatus, as well as an optical flowmeter comprising, in combination, the tubular measuring device, and the electronic apparatus for measuring and reading the flow-rate and/or the temperature, characterised by an extreme versatility in use. In fact, the tubular measuring device proves to be structurally simple and inexpensive, and is consequently suitable for permanent application at any point of a system or of a duct in which it is necessary to periodically check and measure the flow-rate. The operator will consequently have at his disposal a single reading instrument, whose light transmitting diode and receiving diode will be inserted each time into the corresponding seatings in the outer tubular body 11 of the measuring device, at the moment of use, and then subsequently removed.

[0044] It is understood, however, that what has been described and shown with reference to the accompanying drawings has been given purely by way of example and that other modifications may be made to the tubular flow-rate measuring device, to the electronic reading apparatus and to their assembly, without deviating from the scope of the accompanying claims.

Claims

1. Device (10) for measuring the flow-rate of a fluid, the device (10) comprising:

   - an outer tubular body (11) provided with an inlet pipe fitting (12) and an outlet pipe fitting (13) for the fluid;
   - a tubular element (15) made of transparent plastic material, which sealingly extends inside the outer tubular body (11), between the aforesaid inlet and outlet pipe fittings (12,13);
   - said outer tubular body (11) being provided on opposite sides with openings (18',19') for seating, respectively, a light emitting element (18) and a light receiving element (19) facing with each other;
   - an axially slidable light shuttering member (21) entrained by the flow within the inner tubular element (15), said light shutter (21) being shaped to partialize the light beam between the light emitting element (18) and the light receiving element (19) to provide an electric signal proportional to the flow-rate; and
   - a biasing spring member (26) acting on the light shuttering member (21) to balance the thrust exerted by the fluid flowing along said inner tubular element (15) of the device (10).

2. Device (10) according to claim 1, **characterised in that** the light shuttering member (21) comprises a guide cage (22) having passages for the fluid, and a light shuttering body (24) for gradual interception of the light beam between said light emitter (18) and said light receiver (19) of the device (10), said light shuttering member (21) extending from said guide cage (22) and being coaxially arranged to the inner tubular element (15) of the flow-rate measuring device (10).

3. Device (10) according to claim 2, **characterised in that** said light shuttering member (21) is provided with a shaped body (24) converging towards the inlet pipe fitting (12).

4. Device (10) according to claim 2, **characterised in that** said light shuttering member (21) is provided with a conical shape.

5. Device (10) according to claim 1, **characterised in that** the light shuttering member (21) comprises a cylindrical body (33) provided with an axial passage (34) for the fluid.

6. Device (10) according to claim 5, **characterised in that** said cylindrical body (33) of the shuttering member (21) is provided on opposite sides with openings (35) for the passage of the light beam.

7. Device (10) according to claim 6, **characterised in that** said openings (35) for passage of the light beam comprise side edges diverging towards the inlet pipe fitting (12) for the fluid.

8. A flow-meter comprising in combination:

   - a tubular flow-rate measuring device (10) and an electronic flow-rate reading apparatus (20), in which said flow-rate measuring device (10) comprises:

     - an outer tubular body (11) provided with an inlet pipe fitting (12) and an outlet pipe fitting (13) for the fluid;
     - a tubular element (15) made of transparent plastic material which sealingly extends inside the outer tubular body (11), between the aforesaid inlet and outlet pipe fittings (12,13);
     - said outer tubular body (11) being provided on opposite sides with openings (18',19') for seating, respectively, a light emitting element (18) and a light receiving element (19) facing with each other;
     - an axially slidable light shuttering member (21) entrained by the flow within the inner tubular element (15), said light shuttering member (21) being shaped to partialize the light beam between the light emitting element (18) and the light receiving element (19) to provide an electric signal proportional to the flow-rate; and
     - a biasing spring member (26) acting on the light shuttering member (21) to balance the thrust exerted by the fluid flowing along said inner tubular element (15) of the device (10); and

   in that the light emitting element (18) and the light receiving element (19) are connected to an electronic reading apparatus (20) and are removably disposable in the side openings (18',19') in the outer tubular body (11) of the measuring device (10).

9. Flow-meter according to claim 8, **characterised in that** the electronic reading apparatus (20) comprises a microprocessor (28) operatively connected to the light emitting element (18) by a power adjusting interface (29).

10. Flow-meter according to claim 8, in which the microprocessor (28) is programmed to self-adjusting the power supplied to the light transmitter (18), in relation to the level of a setting signal provided by the light receiving element (19) through AD Converter (30).

11. Flow-meter according to claim 8, further **characterised by** comprising a fluid temperature detecting

probe, connected to the electronic reading apparatus (20), said probe being removably disposable in a corresponding seat (36) in the outer tubular body (11) of the flow-rate measuring device (10).

12. Flow-meter according to any one of the previous claims, **characterised in that** said light emitting element (18), said light receiving element (19) and said probe for detecting the fluid temperature are provided on a common support.

13. Flow-meter according to claims 8 and 11, **characterised in that** the microprocessor (28) of the electronic reading apparatus (20) is programmed to selectively provide a measurement of the flow-rate, and respectively, a detection of the fluid temperature.

14. Flow-meter according to claim 8, **characterised in that** the microprocessor (28) is programmed to provide a measurement of the flow-rate, in different measuring units selectable by the same electronic flow reading apparatus (20).

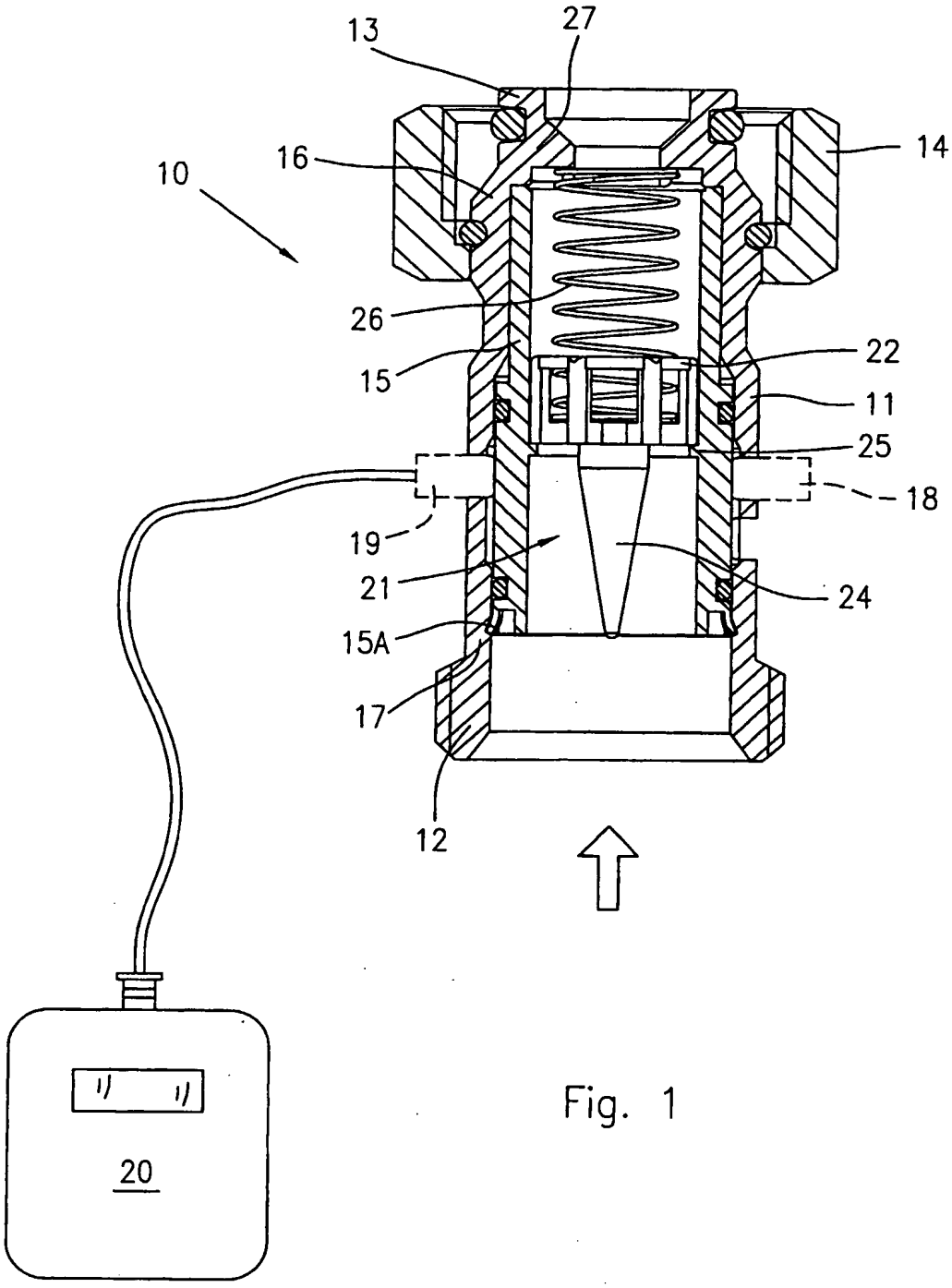

Fig. 1

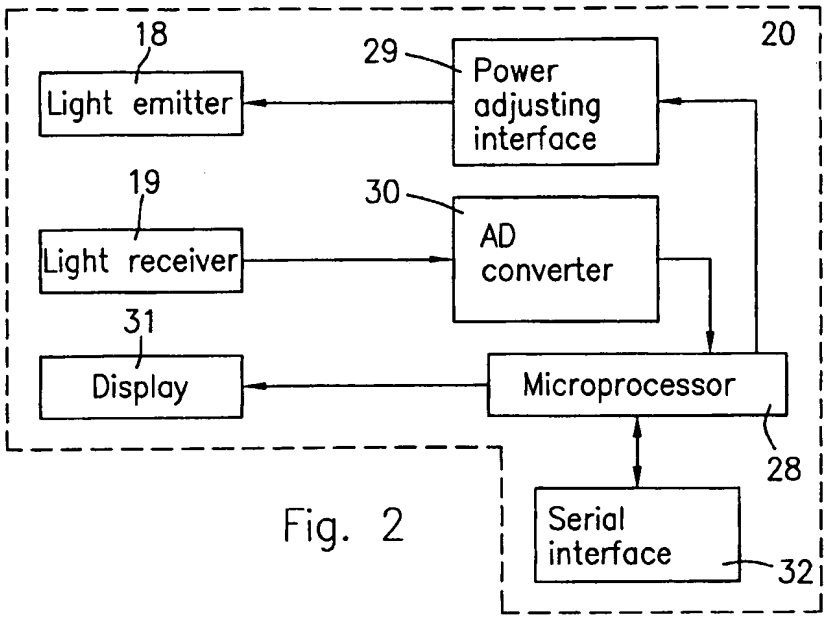

Fig. 2

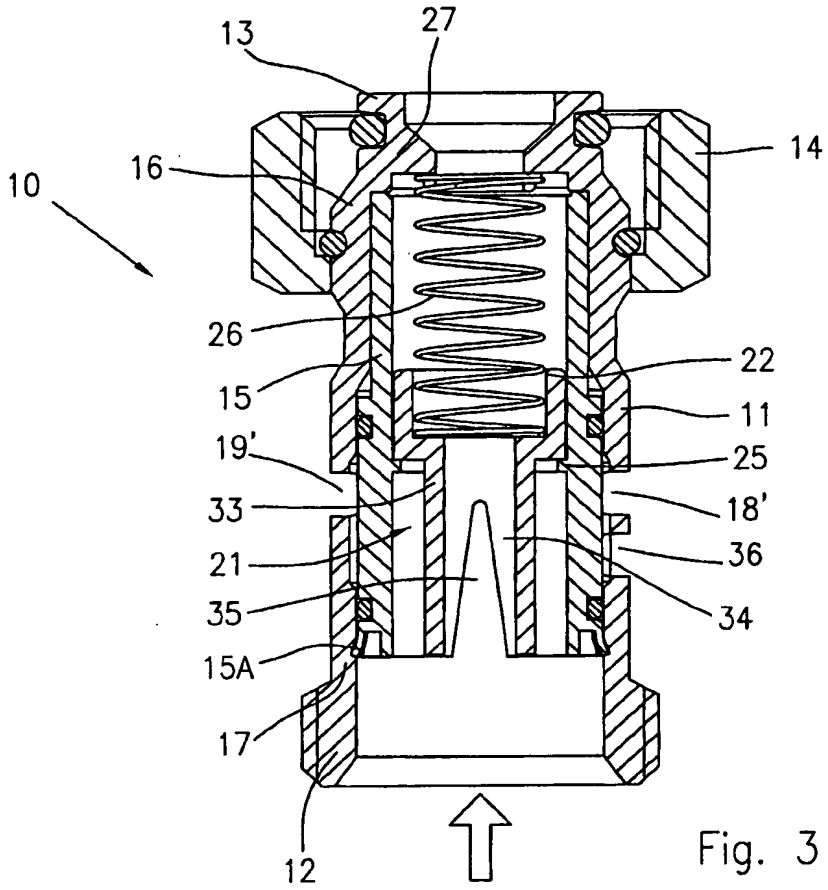

Fig. 3

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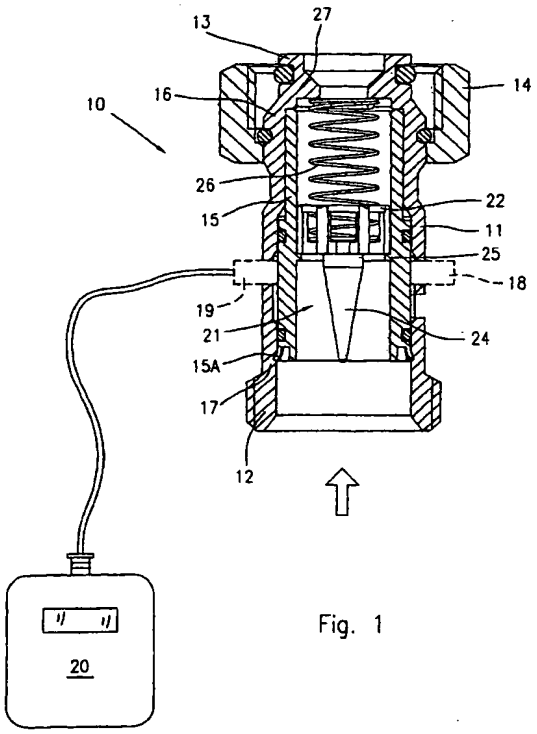

Fig. 1

EP 1 243 900 A3

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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 6346

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y	FR 2 451 596 A (PACE ITALO) 10 October 1980 (1980-10-10) * page 5, line 20 - page 7, line 25; figure 1 *	1,2,5-8 3,4	G01F1/28
Y A	US 2 827 008 A (HODGE FRED F) 18 March 1958 (1958-03-18) * column 5, line 17 - column 8, line 13; figures 7-11 *	3,4 1,2,8	
X	US 3 673 863 A (SPACEK GEORGE CTIRAD) 4 July 1972 (1972-07-04) * column 7, line 33 - column 8, line 54; figures 6,7 *	1-4,8	
A	US 3 759 099 A (MC GREGOR R) 18 September 1973 (1973-09-18) * column 2, line 67 - column 3, line 28; figures 3,4 *	1-4,8	
A	US 5 932 814 A (HUTCHINSON HAROLD D) 3 August 1999 (1999-08-03) * column 7, line 11 - line 30; figure 1 * * column 9, line 45 - column 11, line 31; figures 11A-18B *	1-4,8	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G01F
A	DE 25 09 447 A (RAU SWF AUTOZUBEHOER) 16 September 1976 (1976-09-16) * the whole document *	1-4,8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 April 2003	Boerrigter, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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11-04-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2451596 A	10-10-1980	FR 2451596 A1	10-10-1980
		CA 1132483 A1	28-09-1982
		DE 2948462 A1	26-06-1980
		GB 2044295 A ,B	15-10-1980
		IT 1207956 B	01-06-1989
		SE 7910023 A	07-06-1980
US 2827008 A	18-03-1958	NONE	
US 3673863 A	04-07-1972	GB 1349951 A	10-04-1974
US 3759099 A	18-09-1973	NONE	
US 5932814 A	03-08-1999	US 5847288 A	08-12-1998
DE 2509447 A	16-09-1976	DE 2509447 A1	16-09-1976

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82